ON THE CAUSES OF

Hæmorrhage after Tooth Extraction, and the Immediate Treatment.

BY

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Causes of Hæmorrhage after Tooth Extraction and the Immediate Treatment.

By Benjamin Ward Richardson, M.D., F.R.S.

Mr. President and Gentlemen,—Thirty-two years ago I delivered before the then existing College of Dentists a lecture on hæmorrhage in its bearings on the practice of dentistry. This lecture, very favourably received at the time, and very often quoted since in works of general as well as dental practice, largely increased my after experience of the subject on which it treated. Every year brought me into contact with new cases and new facts, and I find, on reference to notes taken in the year 1871, that I was called six times during that year to arrest hæmorrhage after tooth extraction. This was exceptional; but, altogether, spread over the long term of practice I have passed through since 1850, and excluding seven previous years of preliminary medical studies, I must have had from one hundred and twenty to one hundred and thirty instances of hæmorrhage under my care. It is from the study of this experience I shall venture to speak to you to-night, and if I succeed, I shall be gratified. If I fail, I shall, Sir, throw all the blame on you for having chosen the subject.

The subject is essentially practical, and to deal with it in a practical manner I shall divide it into two parts, namely: Cause and Treatment.

PRELIMINARY NOTE ON COMPARATIVE RARITY OF HÆMORRHAGE AT THE PRESENT TIME.

At the outset I should like, however, to make an observation which nothing except a long experience could supply. I am quite sure that the accident of hæmorrhage after extraction of the teeth is much less frequent than it was a quarter of a century ago. At that time it was, comparatively, a common accident; at the present time it is a comparatively rare accident. For my own part I have never had a case which ended fatally, although two or three have approached very near to a fatal termination; but I knew, before the period I have named, of more than one death from the hæmorrhage. Since that time I have not known of one fatality, and the occurrence of bad cases is much limited. There is not the least reason for surprise at this fact, for many causes are at work leading to it. In the first place, the progress of dental surgery is greatly advanced; the rude method of operating with the key or with coarsely constructed forceps has ceased. Secondly, the knowledge that different teeth call for different modes of manipulation or different instruments—knowledge once altogether confined to a limited few—is general knowledge and practice. Thirdly, the means to be adopted to stop hæmorrhage, if it be developed, is much more accurate than it used to be. The operator has gained confidence, and, with that, coolness and patience in endeavouring to arrest the flow of blood—elements of treatment of the supremest importance. Beyond these advancements there is yet another, which probably ought to stand first. I mean that what we physicians call the hæmorrhagic diathesis is greatly reduced amongst the members of the community. This is one of the most striking facts of our civilization—so striking that I am rather surprised it should have been left to me to call attention to it. In plain words, the blood of the nation has improved in quality. What was termed scurvy was not long ago a prevailing condition. There was land scurvy and there was sea scurvy. Now both are much less common. But the scorbutic state induced in all cases by an improper diet, or descending by heredity from parents who have been badly fed and badly nourished, meant above all things else poor blood, blood that would not coagulate or seal up the broken vessel. Such blood was made by bad food; it was also made by bad drink, for it is the blood of an intemperate community, and bad food and bad drink having to some extent been dismissed and replaced by wholesomer substances, the blood is of better substance, is a sealing blood, and ceases to flow out of minute vessels less seriously, because it makes for itself the best of all plugs in its semi-solid or coagulated form.

CAUSES OF HÆMORRHAGE.

Coming now to the practical part of my subject I cannot do better than reconfirm a position I originally maintained, namely, that there are three distinct conditions leading to dangerous hæmorrhage after extraction of teeth: (1) abnormal fluidity of blood in the subject submitted to operation—purpuric hæmorrhage; (2) deficient contractile power of the divided vessels—vascular hæmorrhage; (3) Mechanical lesion favouring the flow of blood—mechanical hæmorrhage.

Hæmorrhage from Fluidity of Blood.

We must bear in mind what has been said above relative to the present comparative rarity of this form of hæmorrhage. Although much less common now than formerly, hæmorrhage from fluidity still occurs. The examples of it divide into two classes—(*a*) the *aqueous* and (*b*) the *scorbutic* or *saline*.

The pathological character of the *aqueous* type is special. The blood of the patients who are subject to it is in a state of extreme fluidity, the fluidity being due to an excess of water, so that the plastic parts of the blood, and also the saline parts, are dilated in an unnatural degree. I do not know of any proof that in these cases there is an actual deficiency of fibrine. If there were, the muscular structure of the patient would probably undergo some modification—a condition by no means necessary, since the disease may be seen in persons whose muscular development and muscular power is good, if not actually perfect. But in the blood the relative natural proportion of water to the colloid matter is disturbed; the water is in excess, the cohesive attraction between the particles of the colloid is reduced, and the blood, imperfectly protected by the plastic fibrine, is ready at any weak point to escape, to run from the vessels in a fine stream, or to diffuse, in the form of purpuric clot, into the peripheral surfaces of vascular organs or over the surface of membranes.

In one instance in which the purpuric state was connected with serous dropsy, I caught a few ounces of blood flowing from a vein of the patient. The blood had a specific gravity of 1,035, or only 15° above the specific gravity of the ordinary renal secretion of the same patient. The blood yielded no clots on agitation; the corpuscles were large, pale, and globular; the amount of water was increased to 860 parts in 1,000, while the fibrine was reduced, relatively, to 1 part in 2,000.

The eruption which accompanies most cases of aqueous purpura is in some cases not developed at all, although the conditions for its manifestation are strongly present. The patient knows that his blood will flow with dangerous freedom if he prick or cut himself, and he will tell you of members of his family who bleed in a similar way; but he may not have any eruption, and may pass through life suffering from what is called the purpuric diathesis. The reason of this is that the colouring matter of the blood is retained by the red corpuscles, and that the fibrine is equally diffused through the volume of blood. The blood consequently makes its course freely until some other factor intervenes. A prick, a slight blow, may be all-sufficient for this purpose, or even pressure induced by the dress. I had one patient in whom a sudden exposure to cold would bring out a characteristic purpuric eruption. In these persons, if the skin be frozen in a small point by ether spray, the purpuric spot will follow, and I have found this a valuable mode of diagnosis in the obscurer forms of the disease.

The eruption is easily developed by other causes in those who, from the condition of their blood, are prepared for it. Excess of alcohol or excessive mental or physical fatigue will induce it. The character of the eruption when it occurs is distinctive—it is diffuse, irregular, and faint. It partakes of the character of a superficial bruise, and it passes through the phases of colour presented by an ordinary bruise, but unattended by swelling.

What has struck me often is the immunity with which persons affected by aqueous purpura go through life. They sometimes carry with them exceeding good looks; they are fairly strong; and they are usually well nourished. If they suffer from great loss of blood, they recover rapidly when the bleeding has been checked, and even regain colour. I doubt, however, whether in true examples of this disease the blood ever becomes of natural quality.

The remote origin of this example of purpura from extreme fluidity of the blood, will, I believe, be ultimately found to be central and nervous. It is among the most marked diseases of the hereditary type and the hereditary quality of the malady is generally diffused through a number of members of a family to an extent specially striking. I was called a few years since to arrest hæmorrhage after a tooth extraction in one of these subjects, and I found that four members of the family had suffered from aqueous purpura. One had died from loss of blood from a leech bite ; another had marked purpuric eruption ; two had suffered hæmorrhage from the gums, and had shown purpuric spots ; and my patient all but died from the escape of blood, which was practically uncoagulable, until syncope from actual loss of blood supervened. In two other cases which have come before me in which no decided hereditary tendency could be discovered, the patients—in both cases adults—attributed their disease to mental causes—that is, to causes acting intensely on the mind. One attributed the disease to a severe fright occurring during childhood ; the other to sudden and excessive grief. I believe both were correct in their surmise, because they based it on clear and reasonable evidence of facts. But how the blood can be physically modified by mental shock I do not assume to know.

The summary of this condition runs as follows : —There is usually a history of hæmorrhage of fluid blood caused by very slight wounds and restrained with difficulty. There is a history either of hereditary disposition to the disease, or of its induction by some nervous shock or injury. The blood is very fluid when taken from the body, and does not coagulate. The corpuscles of the blood are large, and deficient in central depression. The specific gravity of the blood is low, and the specific gravity of the urine is low. The eruption on the skin is not a persistent symptom, and when it appears it consists of a diffused blotch resembling a bruise, with neither swelling nor hardness. The eruption is brought out by any cause that for a moment paralyses the vascular tension. It is brought out readily by extreme cold. The patients themselves are not, as a result of the disease, in an emaciated or enfeebled condition, and they do not bleed from open surfaces, except when the vessels are divided. In other words, their blood does not exude through closed vessels, but it easily flows from a wounded point, as from a prick or the suction of a leech.

If all patients who came before the operator carried with them this history there would be no obscurity. The operator would know with what he was dealing, and would probably think it wise not to accept the risk of an operation. Indeed more than once I have been consulted on the propriety of operating under such circumstances, and on one occasion gave a verdict against operating, which I had occasion to know saved the gentleman who consulted me the most terrible anxiety, for that patient soon afterwards died from hæmorrhage from a slighter cause than tooth extraction. Unfortunately it may happen that no such preliminary history is supplied, and then we get the true typical case, two illustrations of which I will give—one from the practice of Dr. Roberts, of Edinburgh, most faithfully recorded by him, the other from my own practice.

Dr. Roberts' patient was a Mr. Pen, a man of middle age and full habit of body. He came to Dr. Roberts to have a loose wisdom tooth removed from the right side of the lower jaw. The tooth had three small fangs, the anterior one the largest. The hæmorrhage, not more than usual, stopped before the patient left the house, the alveolus being plugged with lint wetted with camphorated spirit of wine. At half past four of the same day Mr. Pen called again on Dr. Roberts, the blood flowing in full stream from the alveolus. Plugging with lint and firm pressure with a cork was now adopted, together with astringent lotions. By this means the bleeding was staunched, so that the saliva came away from the mouth uncoloured. The patient now informed Dr. Roberts of his history, viz., that he had had a tooth taken out before, and that there was then considerable hæmorrhage, which lasted for three days, but was assisted by the application of caustic ; he also reported that his gums had bled to a considerable extent, and often for a fortnight at a time. On Monday morning, one day later, Dr. Roberts was sent for, and found that the bleeding had continued all night, and that there was neither clot in the alveolus nor in the blood which was spat out. Caustics and solutions of lead and alum were now applied with benefit, and for an hour all appeared safe. In the course of the day Dr. Hay was called in, and finding the hæmorrhage still present he applied the actual cautery. Afterwards, with an iron button properly adapted, Dr. Roberts applied the actual cautery, but with no better result. In the act of applying the cautery the second time the patient started, and the under lip was slightly burned. From the wound thus produced blood oozed freely for several days. Attempts to check the bleeding were vain until Wednesday, when the loss was more severe, and indications of syncope supervened. Towards the evening there was some improvement, the hæmorrhage being under control by simple pressure. Mild purgatives were given in consequence of a considerable quantity of blood having been swallowed. On Thursday there was sinking, and although the hæmorrhage from the alveolus had ceased there was hæmorrhage from the gums and from the left nostril. From this time until December 31st there was improvement, when suddenly there was a change for the worse; there was slight hæmorrhage from the nostril, gums and alveolus, which continued. The gums were very turgid, of purple colour, and almost covered the teeth; the features were collapsed, the cheek was discoloured, and all the symptoms of purpuric hæmorrhage were decided. Death put an end to this painfully interesting case on Tuesday, three weeks and two days after the operation.

The case thus recorded is typical, and is of the purest type. Of its kind it is the truest example I have met with anywhere, either in reading or practice.

I was called in the year 1869 to a young lady between sixteen and seventeen years of age. She had enjoyed the best of health; had been brought up in a healthy, natural way; had taken abundance of outdoor exercise, and had been tended with all the care devoted to an English child much beloved by friends, whose means extended to wealth.

This patient was obliged to lose an upper molar tooth on the left side. The tooth had undergone rapid decay, and all attempts to preserve it were useless. The extraction was easy, and was performed with his usual skill by one of our most accomplished operators of the metropolis. At the time there was rather more bleeding than is usual, but so entirely free was she from any sign of ill-health—there was not so much as an anæmic cast—no notice was taken of the hæmorrhage. The hæmorrhage soon ceased of itself, and gave rise to no symptom either of syncope or of exhaustion.

The tooth was extracted about midday, and all went on well until the evening, when, during the excitement of dancing, blood began to flow from the alveolus. The blood as it flowed gave no sign of clot; it was of red colour, but thin, and was wanting altogether in plasticity. The loss of blood continued for many hours, until, in short, dangerous signs of exhaustion showed themselves, and on my arrival there was some cessation of the hæmorrhage from exhaustion of the propulsive power of the heart. In this state I succeeded in plugging the alveolus so firmly with styptic colloid on cotton wool that when the patient began to recover the bleeding did not return. Three nights afterwards, during sleep, my patient, by mere accident, moved the plug in the alveolus, when once more there flowed forth the fluid blood. Happily, again during semi-syncope, I succeeded in sealing up the bleeding surface with the same kind of styptic stopping, and by the exercise of extreme attention the surface healed without the recurrence of hæmorrhage.

The patient herself in this case afforded no external evidence whatever of her peculiar diathesis, but her family history told the story. Her infant brother had lost his life by the escape of blood from a small injury to the skin.

The second form of purpuric or hæmorrhagic blood to which I would direct attention I designate as the *saline* type. In this type there is no deficiency of plastic matter in the blood, but an extreme fluidity due to an excess of soluble saline material. The synthesis of this disease was well brought out in my early experiments, in which the blood of lower animals was rendered preternaturally fluid by administration of alkaline salts. The distinguished Huxham observed a similar condition in the human subject in the case of a man who habituated himself to the taking of bi-carbonate of ammonia until his blood became permanently fluid. The same condition has, again, been observed on a large scale in the scurvy produced by too long a subsistence on foods preserved by salt, and especially when under such foods the body has been exposed to extreme cold, as in Arctic explorations. The same condition may also be observed in certain advanced stages of alcoholic disease. Very soon after the introduction of chloral into medical practice and its use by the chloral *habitués*, I met with a case of purpuric chloral eruption, a saline purpura caused, as was easily explained, by the accumulation in the blood of the sodium formate resulting from the decomposition of the chloral in the body. I have now seen four instances of saline purpura so induced.

In these cases the specific gravity of the blood is increased, and the attraction of cohesion in the fibrine is suspended by the presence of an agent which holds the water in too close combination with colloidal matter. In this condition the fibrine, the albumen, and the colouring matter of the blood all diffuse through the membranes, and the exudation of blood at feebly resistant surfaces is easily effected; hence the bleeding spongy gum in well-marked illustrative forms of this malady. Persons suffering under saline purpura are the true scorbutics of the older school of physic. They supplied the patients whose blood, when our forefathers drew it, as they usually did, was seen to separate, while it was flowing, into fibrine and serum, just as fibrine separates when we precipitate the corpuscles by adding a saline solution to blood newly drawn.

There is in this form of purpuric disease no necessary evidence of hereditary tendency. On the contrary, the malady is usually caused by error of diet or toxic habit.

The eruption, when it occurs in saline purpura, is more sharply defined as a spot, *macula*, than in aqueous purpura. It is not induced by an injury, but breaks out spontaneously. Often there is no eruption; but there is always a tendency of exudation of blood from the gum, from the throat, and occasionally from the lung.

The summary of this condition runs as follows: —There is no necessary history of hæmorrhagic or fluid blood, nor yet of hereditary disposition to such hæmorrhage; but there is always a history of an induced morbid condition from error in diet, exposure to some noxious agent, or disintegration of blood from disease. The blood is fluid when taken from the body, but from its fibrine separates, and the corpuscles are shrunken and crenated at their edge. The specific gravity of the blood is high, and the specific gravity of the urine follows the same rule. The tendency of the blood in these cases is to exude from the soft spongy surfaces, as from the gums; and if an eruption present itself, it is in the form of maculæ or petechiæ. Transudation of blood by the mucous secretions is not an uncommon diagnostic fact of this type of purpura. Venous murmur is also not uncommon as another point of diagnosis.

I have seen very few examples of hæmorrhage from this class after tooth extraction, a fact easily accounted for on the theory that few operators care to operate under such unfavourable conditions. One instance, however, came before me in which profuse hæmorrhage at the time continued for several weeks, ceasing at last under constitutional rather than local treatment.

Vascular Hæmorrhage—Hæmorrhage from Deficient Contractile Power of Blood Vessel.

What I call vascular hæmorrhage is a form of hæmorrhage after extraction of the teeth in which the fault lies in a primary want of contractile power of the blood vessel—artery—divided during the operation. In perfectly healthy states of the body, in addition to the process of solidification of blood, the obstruction from the contraction or shrinking of the divided vessel is a powerful agency in arresting hæmorrhage. Moreover, the act of removing a tooth is favourable, because the vessel is not cut cleanly across, but is torn, by which the contraction of the coats of the vessel is greatly increased. At the present time our surgeons are practising a mode of arresting hæmorrhage, even from very large arteries, by what is called the torsion method, and which consists, in fact, of seizing the artery with a pair of strong forceps, pulling it gently forward, and twisting it firmly. This same process the dentist carries out unintentionally to a considerable extent whenever he extracts a tooth, and there can be little doubt that the rarity of severe flux of blood after operations on the teeth is partly accounted for by this circumstance.

There exists, notwithstanding, a distinct class of cases in which there is copious hæmorrhage, owing to absence of true contractile power of the arterial tube, and there are constitutional conditions leading to this particular state of vessel. The vessel is torn across and does not contract, whereupon the blood continues to flow with sufficient freedom to wash away any clot that may be formed and give rise to copious hæmorrhage.

There are three or four classes of persons who suffer from hæmorrhage of this character on slight causes. In the largest class a slight physical accident on the body is apt to produce a discoloured spot or bruise, with swelling, and after a time firmness of structure at the point of the swelling. These subjects are usually well nourished and young. They are disposed to be fat, and if they are carefully inspected while undressed they are found to possess some deformity of body more or less marked. The spine will show a slight curvature, or a lower limb will be a little distorted, or the chest will be badly developed or misshapen. The blood may, however, be perfectly natural, and there may be no hereditary hæmorrhagic diathesis. If a little blood be drawn for examination, it is found to coagulate quickly and firmly. The colour of the blood is natural, and the corpuscles are of normal size and outline. There is, in fact, no definable disease of the blood.

In other examples of this type of hæmorrhage, the patients are what is called anæmic or bloodless, and it has been customary to look upon these as persons in whom the blood is unusually fluid. This is not strictly the fact. Such persons, it is true, bleed readily from slight causes, but not because their blood is necessarily deficient in power of coagulation. The clot formed by their blood may be loose and yield a large exudation of water, but it coagulates in sufficient degree to play an important part in checking the flow.

In a third class of vascular hæmorrhage the effect of alcohol plays the leading part. The subjects here are free partakers of the subtle poison. They are generally in the middle period of life, and present all the evidences of alcoholic constitutional change—the vascular cheek, the excitable, feeble heart, and nervous uncertainty.

A fourth class coming under this order are victims of syphilitic disease, the influence of which on the structure of blood vessels is so marked that at Netley Hospital there exists a whole series of specimens of arterial degeneration from this cause.

In all these varieties the blood may retain its power of coagulation and in all of them the free hæmorrhage is traceable to vascular deficiency. Either the minute vessels are paralysed, or there is some degeneration of structure in them so that they permit the blood to flow through them under slight mechanical injury, innervation or degeneration.

In summary, the subjects of vascular hæmorrhage are persons of enfeebled constitutional and nervous type, showing relaxed circulation in sudden blushing and suffusion of the face, with other signs of relaxed peripheral circulation; or, they are anæmic, or alcoholic, or victims of specific degeneration.

It has befallen me to have illustrations of all these types of hæmorrhage. In two cases of anæmia the symptoms were extreme, although recovery took place. In one instance of alcoholic form the patient, a lady, was brought from the dentist's chair to my house in a carriage and was treated with the utmost difficulty, owing not so much to a loss of blood as to her own restless fears and rambling resistance to everything that was being done for her. In one of the examples of specific disease such was the degeneration of the upper maxillary bone and palate, as well as of the blood vessels, that *in extremis*, while the patient was in syncope I cut away with a fine saw the whole of the hard palate, and so reaching the anterior palatine artery which was yielding the blood, stopped the effusion by torsion and so controlled the hæmorrhage that the patient ultimately recovered and is still alive, twenty-four years after the event described.

In both these cases I was aided by the circumstance that the blood coagulated, and I dwell on them in order to draw the distinction between purpuric hæmorrhage and vascular.

MECHANICAL HÆMORRHAGE.

It remains for me only to mention under the heading of cause the last-named division—hæmorrhage from mechanical lesions favouring the flow of blood. These are lesions due to accident connected with the extraction, fracture of alveolus or tearing away a portion of alveolus. I have once or twice known this accident, but in my experience it is extremely rare as a cause of hæmorrhage, and as the treatment is the same as for vascular hæmorrhage I need not dwell upon it more than to say that in the worst example I have seen the tooth was so firmly adherent to its socket that nothing but removal of a portion of alveolus could have secured the extraction. The hæmorrhage was profuse but controllable, and no serious injury resulted.

THE QUESTION OF TREATMENT.

We come now to the all-important question of the immediate treatment of the cases under consideration. It is unnecessary for me to trouble you with any thoughts or suggestions as to ultimate or constitutional treatment. It will be most profitable to consider how best at the moment the dentist can stop the flow of blood and let his patient depart from his care quite secure. It will be inferred that in the cases already commented on, various remedies have been adopted, and I am sure that I must have seen twenty or more tried with more or less of success. My desire is to name the simplest and the best in the short time still at my disposal. In my early practice, on being summoned to a case, my instant attempt was to stem the flow of blood, without enquiring too minutely what was the cause of the accident. By and by I found that there was rarely any great reason for hurry; that it would take a long time for a person to die from the loss of blood, and that faintness was not such an anxiety as some make of it, but rather assisted the action of remedies, because it relieved the tension of the circulation, and made it easier to manipulate on the point from which the hæmorrhage proceeded. Gradually I found certain reliable steps, which I now follow, and which I think should always be followed.

In the first place, it is essential to ascertain if the blood that is being lost is or is not coagulable. If the blood is coagulable, if a little of it caught in a cup or glass goes into a firm clot in the course of two or three minutes, much cause for alarm is removed, and the line of treatment is sufficiently clear. We may be sure in such a case that the cause is either vascular or mechanical, that there is failure in the contraction of the bleeding vessels, or adhesion of the vessel to the surrounding bone tissue, or rupture of an abnormally large vessel. Whichever it may be there is the assurance at hand that the blood is in a favourable condition for forming a plug, and that if it can be retained in the cavity a sufficient time to enable it to form a firm clot it will produce a natural arrest. I shall deal with this simple treatment first.

Treatment of Vascular and Mechanical Hæmorrhage.

This treatment includes three methods. (1) The styptic. (2) The plug with pressure, with or without styptic. (3) The cautery. In the beginning of my practice I trusted mainly to styptics in this class of case, and after many trials I came to the conclusion that nitric acid was the best. I believe still, that as a styptic it is the best, but it has the disadvantage of being very difficult to manipulate with, owing to its extreme caustic and destructive properties. I afterwards invented styptic colloid, which is composed of tannin in collodion, with addition of tincture of benzoin; and for ordinary cases I do not know of a better. The colloid can be applied on cotton wool and a firm plug of it can be inserted with much facility. When this did not seem sufficient I resorted to perchloride of iron applied in solution with cotton wool. It has often happened that these simple methods have proved effective, when they have not I have proceeded to the second plan, that of the plug with pressure.

Three kinds of plugs have been used. One is made of soft, well-teased cotton wool saturated with styptic colloid. The mass is not put in in too moist a form, but mixed in a cup is allowed slightly to dry by the evaporation of the ether. Then, after well drying the bleeding cavity with a pledget of lint, the colloid cotton is inserted with forceps, the point of which has been dipped in olive oil, layer by layer, as in a process of roughly stopping a tooth, until the cavity is completely filled. A little bit of dry wool is next made to cap the whole, and pressure is made with the finger or with Harding's compress until the plug is solid, which, owing to the escape of ether, is rather a quick process.

A second plan is to use a perchloride of iron plug made by saturating cotton wool with solution of perchloride of iron, and then drying the cotton down. Cotton so prepared can be kept in bottles ready for use, and can be applied as a plug in a similar manner as the colloid. I have also constructed what may be called the *wick styptic*, and this is very useful in minor cases. It consists of a glass tube having a narrow point, through which is drawn a piece of cotton wick saturated with perchloride. A portion of the wick projecting from the narrow end of the tube can easily be inserted and firmly held in the cavity; when it becomes saturated with blood it can be cut off, a new bit pulled out, and a fresh application made.

The best plug of all I have been able to construct is a gutta-percha styptic plug. It is very convenient, and is easily kept at hand for an emergency as a disc. The discs, here named, consist of gutta-percha saturated with a styptic, tannin or perchloride of iron. One of these discs, picked up by the forceps and held for a short time in hot water, softens and becomes so malleable that it can be inserted into any cavity. The bleeding tooth cavity is quickly dried with absorbent cotton wool, and is then filled with the plastic styptic, pressed firmly down to the bottom and held there until it becomes firm. There is no fear of putting in the plastic styptic too hot, since heat favours coagulation. I have placed a few of these styptic discs before the Society, this being the first time on which I have brought them into notice.

Treatment of Purpuric Hæmorrhage.

The lines of treatment above-named are required for cases of mechanical hæmorrhage, in which the blood is naturally coagulable. I therefore pass at once to consider the management of those more serious accidents in which the blood is deficient in plastic quality. I need not dwell long on this matter, because my mind is made up in regard to treatment. Presuming that the blood flowing from the injured part shows no tendency to clot and is discharged in a steady stream, which is not arrested by pressure or the ordinary application of styptic, it is necessary at once to produce secondary or albuminoid coagulation. It must be remembered that no blood is so constituted that it cannot be made to coagulate. In the most fluid blood there is albumen, which will not become solid spontaneously but can be solidified by various means artificially. Three of these means we have at hand, namely, tannin, perchloride of iron, and the subdued actual cautery. It may be well always to try the two first-named styptics, and in the perchloride percha styptic and the percha tannin styptic, to some extent, we have substances which will coagulate albumen, even when they are not heated, and will instantly coagulate if heated to 150° Fahr. These, therefore, are very ready in emergency. If they fail, no time should be lost in resorting at once to the cautery. When the electric cautery is at hand, it is the most convenient; it does not alarm the patient, and the heat of the terminal probe is sustained in the cavity; but if the electric cautery be not at hand, the next best is the small iron cautery, an iron bulb terminating in a rounded point and fixed in a strong handle at an oblique angle. This bulb and point can be made red-hot in the flame of a spirit lamp or of a gas jet. But it is not necessary to alarm the patient by using it while it is in a state of glow. It may be allowed to cool down until all redness has disappeared and can then be inserted deep down into the bleeding cavity. Skilfully used it gives no pain of moment and its effect is, as a rule, immediate in the arrest of blood. Should it fail there is no other direct local measure that can be depended upon. Even ligature of the carotid if the case should come into the hands of the surgeon would be a doubtful measure, since hæmorrhage from the surgical wound might be uncontrollable and simply add to the danger.

Happily, for my part, the danger has only once pressed to the extent of suggesting so extreme a measure, and then the hæmorrhage was stopped by the cautery and did not return. In other cases, four in number, the cautery has acted at once. It is a remedy applied with unusual readiness if the idea of fear of it be not exaggerated. It should never be used at such a heat as to destroy structure. The coagulating power of heat over albumen, viz., 140° F. is all that is required strictly, but this may be safely exceeded to 150 or 160 degrees.

Before I conclude there are two other topics to which I must call attention. It is customary when the accident of hæmorrhage occurs for the operator, or for some bystander, to administer wine, brandy, or some other alcoholic stimulant to the patient, under the false idea of sustaining the vital power. It is my solemn duty to protest against this practice on the strictest and purest scientific grounds. The action of alcohol, under such circumstances, is injurious all round. It excites the patient and renders him or her nervous and restless. It relaxes the arteries and favours the escape of blood through their divided coats. Entering the circulation in a diluted state, it acts after the manner of a salt in destroying the coagulating quality of the blood; and above all other mischiefs, it increases the action of the heart, stimulating it to throw out more blood through the divided vessels. These are all serious mischiefs but the last named is the worst. In hæmorrhage the very keystone of success lies so much in quietness of the circulation that actual failure of the heart, up to faintness, is an advantage; it brings the blood at the bleeding point to a standstill, enables it to clot firmly, when it has that tendency, and so to form the most effective possible check upon the flow from the vessels. In the case I spoke of in which I removed the hard palate the quantity of blood lost during the hæmorrhage amounted to over three pounds weight, and the syncope was so extreme that the patient did not know that anything had been done to him after he returned to consciousness. But not a drop of any stimulant was administered him at any stage, and the care to avoid any such administration was carefully sustained after recovery, in order that the rapid action of the heart might not overcome the resistance of the tenderly sealed up vessels. Indeed, I am certain that this rule of avoiding stimulation was far more effective in saving my patient's life than any surgical skill of mine, for the vessel I twisted might have become plugged up naturally during the syncope, but nothing would have prevented the bleeding from breaking out afresh if the heart, instead of being allowed to swing round of itself slowly and safely, had been whipped, for a brief period, into violent action. I refer to this case as typical, because if a stimulant was not wanted in it, a stimulant cannot be called for in examples less severe. The course followed in that case was to lay the patient quite recumbent when signs of faintness supervened, and so long as he could swallow to feed him with warm milk and water freely. This, in my opinion, is the proper treatment to be employed in every instance of syncope from loss of blood.

The second concluding topic has relation to the effect of blood swallowed by patients who are bleeding from the mouth. In all bad cases of hæmorrhage from the mouth some blood is almost, of necessity, swallowed. The act sometimes gives cause for undue alarm, and it invariably alarms the patient. At first I was a prey to some alarm on this score, but experience has shown that the anxiety is groundless. The fact of a person swallowing a good many ounces of blood is not necessarily injurious. The blood is digested and is re-assimilated if it be not carried into the stomach in too large a quantity. When it is carried in in too large a quantity it is usually vomited, with a return of faintness, from which, however, I have never observed any serious danger nor recurrence of bleeding if that has been thoroughly staunched.

There are some other points of after-treatment of hæmorrhage, particularly in examples of the purpuric type. But as such treatment is mainly constitutional in character, and calls for internal remedies, it belongs to the physician and need not be insisted on in an essay which relates exclusively to the art of tiding over danger in the operating room and from one particular class of operation.

SUMMARY.

In summary, the leading points I put forward are that hæmorrhage from tooth extraction is due to one of three sets of causes. (1) To purpuric or fluid blood of which there are two varieties; (*a*) the aqueous, (*b*) the saline. (2) The vascular weakness or paresis of artery, occurring in constitutions (*a*) strumous or scrofulous, (*b*) anæmic, (*c*) alcoholic, (*d*) syphilitic. (3) To mechanical lesion, the result of extensive mechanical injury.

In the treatment of hæmorrhage of the second and third classes styptic treatment with pressure is that most immediately useful, the best styptics being tannin, and perchloride of iron, either of which may be applied by means of the styptic gutta-percha disc. In the treatment of vascular hæmorrhage secondary or albuminoid coagulation must be induced for which the subdued actual cautery is necessary, In all cases alcoholic stimulation is inadvisable; and the fact of blood being swallowed need not afford cause for anxiety.